Standard 7-3 The student will demonstrate an understanding of political, social, and economic upheavals that occurred throughout the world during the age of revolution, from 1770 through 1848.

7-3.1 Summarize the achievements and contributions of the scientific revolution, including its roots, the development of the scientific method, and the interaction between scientific thought and traditional religious beliefs. (H)

Taxonomy Level: B 2 Understand/Conceptual Knowledge

Previous/future knowledge:
This is the first time students have been taught about the scientific revolution, the development of the scientific method and the interaction between scientific thought and traditional religious beliefs. However, this indicator builds upon student knowledge of traditional religious beliefs (the Roman Catholic Church) acquired as part of their studies in sixth grade (6-3.4 and 6-5.6).

In Global Studies, students will summarize the origins and contributions of the scientific revolution (GS-3.3). Students will also explain the ways that Enlightenment ideas spread through Europe and their effect on European society, including the connection between the Enlightenment and the scientific revolution (GS-3.4).

It is essential for students to know that the **Scientific Revolution** was born out of the advancements made in the areas of science and math in the late 1500s and early 1600s. Following the age of exploration, new truths and new research challenged previous thought processes and studies. As evidence mounted, scientists began to question ancient theories and the orthodox teachings of the Roman Catholic Church. Ptolemy's theory of planetary motion (the geocentric theory) and church teachings were brought into question by Copernicus's heliocentric theory**.** Other major achievements included the contributions of Galileo and Newton. Galileo offered support for the heliocentric theory with his laws of motion and his observation of space with use of the telescope. Newton's laws of gravity furthered the laws of motion and continued the challenge of old theories.

The **scientific method** was a major contribution of this time period. This was the logical procedure for testing theories that included beginning with a question, forming a hypothesis that is then tested through experimentation, and finally analyzing data to reach a conclusion. Frances Bacon and Rene Descartes used experimentation and reason to contribute to this process.

A significant conflict arose between **scientific thought and traditional religious beliefs** during this time (6-3.4 and 6-5.6). The theories and books that were published also led to significant conflict with the church. The Bible, as interpreted by the Roman Catholic Church, served as authority for society prior to the rise of science. The teachings of the church, which were based on faith and revelation, felt significant challenge from science, which offered empirical evidence for its theories. With the publication of these new theories, the teachings of the Bible and the church were called into question. This was a

challenge to faith by reason. For the church, political, social, and economic authority was on the line. Scientists like Galileo were called to recant their teachings and reaffirm the teachings of the church or face excommunication.

It is not essential for students to know:

It is not necessary to discuss the contributions of every scientist of this time period, such as Brahe, Kepler, or Edward Jenner, or to have specific knowledge of the works of the scientists, such as Copernicus's *On the Revolutions of the Heavenly Bodies* or Galileo's *Starry Messenger*. Instead, it is more helpful to focus on the broad concepts and major contributions of the time. In that same vein, while there were many contributions made to scientific instruments and medicine during this period, these can be briefly mentioned, for broader understanding but too much time should not be spent in this area.

Assessment guidelines: The objective of this indicator is to **summarize** the achievements and contributions of the scientific revolution; therefore the focus should be on **identifying** the roots and the development of the scientific method. Appropriate assessments will also require students to **explain** the interaction and conflicts between scientific thought and traditional religious beliefs or compare different intellectual, social and political "revolutions' in terms of their fields of achievements, similarities and differences.